

6 CFM Electrochemical Hydrogen Pump and Compressor, Phase I

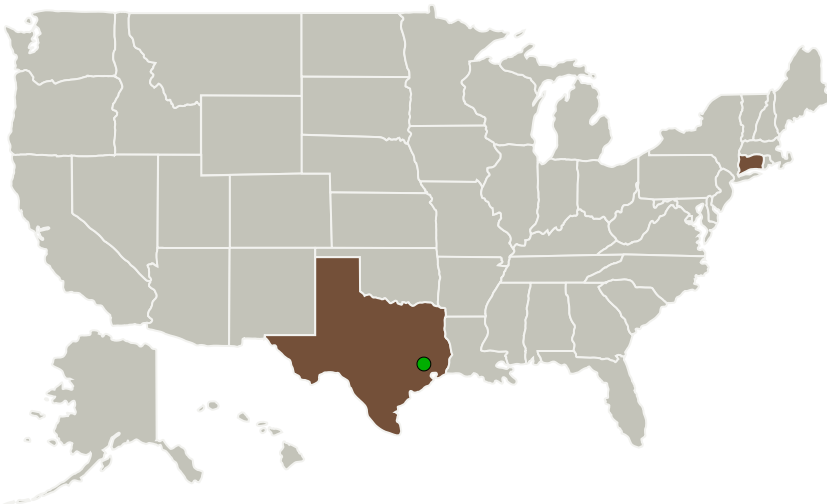
Completed Technology Project (2011 - 2011)



Project Introduction

Hydrogen is an essential resource for space missions. NASA has a need for equipment to generate, handle and store hydrogen. In terms of handling hydrogen, conventional rotating mechanical pumps and compressors require extensive modification and have limited reliability. Electrochemical pumping and compression of hydrogen occurs without any moving parts and is highly reliable and efficient. Sustainable Innovations has demonstrated up to 6,000 psi of compression using electrochemical cell hardware. However, for high flow applications, such as a 6 CFM hydrogen pump for NASA, a departure from traditional electrochemical cell hardware designs is needed. The proposed Expandable Modular Architecture cell design, allows a large variable footprint for the electrochemical stack. This is achieved using modular cell parts to create large active area cells. The modular parts are inexpensive to manufacture and can achieve the high tolerances need for large active area cells. The proposed Phase I activity will demonstrate a single cell Electrochemical Hydrogen Pump & Compressor (EHPC) using the EMA design to validate the modularity of the cell components. The ability to stack large active area cells will also be demonstrated with a four cell EHPC. For both pieces of cell hardware, cycling a pneumatic device will be demonstrated. A manufacturing study will also be undertaken to validate the compatibility of the EMA design with cost reduction pathways. This will facilitate establishing the design criteria for a 3-4 CFM @ 1,000 psi EHPC to be constructed on Phase II

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Sustainable Innovations, LLC	Lead Organization	Industry	East Hartford, Connecticut
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
Skyre Inc	Supporting Organization	Industry Small Disadvantaged Business (SDB)	

Primary U.S. Work Locations

Connecticut	Texas
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Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140217>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sustainable Innovations, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

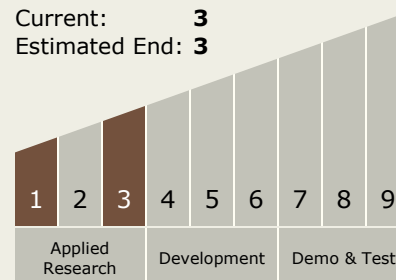
Carlos Torrez

Principal Investigator:

William Mcphee

Technology Maturity (TRL)

Start: **1**
 Current: **3**
 Estimated End: **3**



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Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.1 In-Situ Resource Utilization
 - └ TX07.1.3 Resource Processing for Production of Mission Consumables

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System